SCIENCE

FRIDAY, OCTOBER 18, 1918

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MSS. intended for publication and books, etc., intended for review should be sent to The Editor of Science, Garrison-on-Hudson, N. Y.

THE AMERICAN CHEMIST IN WARFARE[1]

IT was the fortune of the writer in the latter part of 1916, a few months before the United States entered the war, to be sent by the Ordnance Department to study in England, France, Italy, Norway and Sweden certain chemical processes, particularly those having to do with the fixation of nitrogen.

On this trip many chemical plants were visited. In all of them the same story was told of depleted chemical personnel owing to the loss of chemists in the trenches and the consequent handicap under which all these plants were laboring in their attempts to furnish the armies with the sinews of war. The whole munitions program had been retarded owing to lack of technical men, chiefly chemists, and the statement was everywhere made that the greatest mistake that the Entente countries had made had been in giving too little attention to brain power and too much to physical strength. On the other hand, it was pointed out that Germany had carefully conserved her chemists for the development of the new and terrible forms of warfare she was forcing on mankind. Science was being used as it had never been used before, to aid a relentless power, and the only means of combating the new form of warfare was with its own weapons.

Already France, England, Italy and Canada had withdrawn all chemists remaining in the service for chemical duty at home, but many had already been lost and their loss was seriously felt. France had drawn so far as possible on the chemists and engineers of Norway, and England drew on her colonies. Indeed, the chemist who perhaps more than any other in England is responsible for the success

[1] Presented at the fifty-sixth meeting of the American Chemical Society, Cleveland, September 10, 1918.

of England's munitions program is an American; and several English chemists who were living in America returned to England for chemical duty.

With this example in mind, the director of the Bureau of Mines and the Secretary of the American Chemical Society called on the Director of the Council of National Defense, and after consulting with him, at his official request, undertook to obtain a census of American chemists for use in the war that was already imminent. This census was started in February 1917, and has been kept up uninterruptedly to the present time. By July, 1917, some 15,000 chemists had sent in full data as to their address, age, place of birth, lineage, citizenship, dependents, institutions from which graduated, chemical experience, experience in foreign countries, affiliations with technical societies, military training, publications, research work performed, and other data of importance. The list has been continually added to, questionnaires being sent to every new name of a chemist that could be obtained. While the list is not complete, owing to the fact that some chemists, no matter how carefully followed up, will not reply to letters, nevertheless, the data are comprehensive and as complete as they can be made.

The cooperation between the Bureau of Mines and the American Chemical Society was perfect. The bureau furnished its whole statistical force and the society put special clerks at work. The data obtained were indexed and cross-indexed on some 28,000 cards. When America entered the war every chemist was directed to keep the society informed as to his military status, and continual correspondence was carried on by the society direct with officers and privates in order that the chemists of the country might serve the country in the best possible manner. To-day the list consists of some 17,000 filled-out questionnaires, 12,020 membership cards of the American Chemical Society, and some 3,000 cards of *bona fide* chemists actually in war service, most of them in uniform. A card list is kept of officers and enlisted men who are graduate chemists in the United States Army in America; another list of those in France, including both those in chemical service and in the Army and expeditionary forces not yet transferred to chemical service, and another list of those in the Navy. It is believed these lists are reasonably complete and up to date.

This work has involved an expenditure of many thousands of dollars, the writing of over 10,000 personal letters, and the sending of over 50,000 circular communications to the chemists of the country.

Already in the early part of February, 1917, the president of the American Chemical Society, Dr. Julius Stieglitz, had offered without reservation the services of the members of the American Chemical Society to President Wilson in any emergency that might arise and had received an appreciative reply. On February 15, 1917, a similar communication was addressed, by direction of the president, by the secretary of the society to the Secretary of War; and on April 11, 1917, at the Kansas City meeting of the American Chemical Society, the following resolutions were passed, which were widely circulated, and had a profound effect on the mental attitude of American chemists:

Resolved, That we reaffirm the tender to the President of the United States of the services of the members of our society in all the fields in which we are qualified to act.

That the security and welfare of the country demand the organization of all the men and facilities of the United States, so as to insure the greatest possible service and value for each.

The progress of the war thus far principally teaches us that modern warfare makes extraordinary demands upon science, food supply and finance.

For the protection and success of our men under arms we recommend the use, in their respective fields, of all trained chemists, physicists and medical men, including advanced students of these subjects.

To this end, in collaboration with the United States Bureau of Mines, we are preparing a census of chemists. With no desire to avoid field service for men of training in the professions named, we urge that those of special ability be held to the work they can best perform. Thus we may avoid

unnecessary loss from lack of control of the tools and requirements of war.

We hold that the use of platinum at this time in the production of articles of ornament is contrary to public welfare. Therefore, we recommend that an appeal be made to the women of the United States to discourage the use of platinum in jewelry and that all citizens be urged to avoid its use for jewelry, for photographic paper and for any purpose whatever save in scientific research and in the making of articles for industrial need.

A committee consisting of Dr. W. H. Nichols, Dr. M. T. Bogert, Dr. A. A. Noyes, Dr. Julius Stieglitz and Dr. C. L. Parsons had, in June, 1917, drawn up and presented a report on "War Service of Chemists" and "A Plan for the Impressment of Chemists and for the Preservation of the Supply of Chemists." Several important editorials by Dr. Chas. H. Herty and communications to the chemists of the country advising them as to their procedure had appeared in *The Journal of Industrial and Engineering Chemistry.*

That the wisdom of carefully listing the chemists of the country more than warranted the expenditure and effort has been apparent from the first. The war had scarcely begun when the growth of the ordnance and other departments developed a tremendous demand for chemists, first to obtain chemical information from the other side, and soon to develop information on this side. A large part of the chemists now in war work were obtained and classified from this list. The officers of the Bureau of Mines and of the American Chemical Society were the scene of continual conferences regarding chemical personnel and the development of chemical warfare. Practically all of the chemists who early entered the Ordnance Department in a commissioned capacity were either obtained through the American Chemical Society or passed upon by its officers. When the Bureau of Mines began its investigation on gas warfare the list was invaluable, and representatives from practically all of the bureaus and departments in Washington consulted it from time to time as their needs increased.

When the chemists were later drafted into the Army this census served as a basis for determining their qualifications, which later, through the far-sighted assistance of Assistant Secretary Crowell, resulted in chemists being withheld for chemical service.

From the first the chemical personnel of the Army and Navy and the civilian bureaus was partly civilian and partly military. As the war progressed the proportion of chemists in uniform naturally increased as the men were taken from the Army and assigned to chemical duty. The question is still a disputed one—to be settled probably only when the war is over—as to whether a chemist can serve best in a civilian or a military capacity. Certainly in both capacities the demand for chemists has been unprecedented and the development of chemistry in modern warfare to those in touch with the advancement made seems almost a fairy tale.

The first requirement for chemists in quantity in Washington was in connection with gas work organized by Director Van. H. Manning and carried on by the Bureau of Mines with its own funds until July, 1917, after which, steadily increasing funds were furnished to it by the Army and Navy. The gas research work was located at the Bureau of Mines Experiment Station some four miles from the center of the city of Washington.

A branch laboratory of the Bureau of Mines was also established at the Catholic University, Washington, and other branch laboratories and cooperative research work carried on at such institutions as Johns Hopkins, Harvard, Yale, Princeton, Ohio State, Wisconsin, Washington, Kansas, Michigan, Columbia, Cornell, California, Rice Institute, Iowa State College, Bryn Mawr, Massachusetts Institute of Technology, Worcester Polytechnic, etc. Also special problems were undertaken by the National Carbon Company and the National Electric Lamp Association, as well as by chemists and laboratories of many of our other important chemical corporations.

One of the most interesting features of this work was the spirit shown by American chemists and the immediate response made by practically every chemist in America to the call to duty. The organization was rapidly built up

and contained the names of the most prominent chemists in the country, as well as those of hundreds of young chemists who will later become prominent.

When this organization was taken over by the Chemical Warfare Service in June, 1918, there were over 700 chemists at work on problems having to do with gas warfare, the design of gas masks, protection against toxic gases, development of new gases and the working out of processes for those already used, the details of incendiary bombs, smoke funnels, smoke screens, smoke grenades, colored rockets, gas projectors and flame throwers, thermal methods for combating gas poison, gases for balloons and other materials directly or indirectly connected with gas warfare.

This body of chemists reporting to Colonel G. A. Burrell had nearly 1,100 helpers in the way of clerical force, electricians, glass blowers, engineers, mechanics, photographers and laborers, so that when it became a part of the Chemical Warfare Service some 1,800 persons were transferred, of whom over 700 were chemists—among them the leaders of the profession. At the same time the gas defense operations of the Medical Department under Colonel Bradley Dewey, consisting chiefly of the large scale manufacture of gas masks and gas mask chemicals, the gas offense proving grounds under Major William S. Bacon, and the gas defense training under Major J. H. Walton were also transferred to the new Chemical Warfare Service. The story has been told in detail in the September number of *The Journal of Industrial and Engineering Chemistry* and need not be repeated here.

Shortly after this work of the Bureau of Mines was begun the development of the Ordnance and Medical Department created an additional demand for chemists. The chief of the Trench Warfare Section, Lieutenant Colonel E. J. W. Ragsdale, early called for chemists to go to England and France in a commissioned capacity to obtain necessary information. Soon other chemists were required for the planning and building of gas plants and the manufacture of chemicals. The Trench Warfare Section continued this work in greatly increasing personnel until the early part of 1918, when the chief of the newly formed Chemical Service Section was transferred to the Ordnance Department and given charge of the production of chemicals for gas warfare. A new arsenal known as Edgewood Arsenal was established for this purpose. Hundreds of chemists and engineers were employed, and the arsenal had become almost a city in size, with enormous plants ready for operation, when it too was transferred from Ordnance to the newly organized Chemical Warfare Service, in June, 1918.

It was a real epoch in the history of chemistry in warfare when, as a result of conferences held at the Bureau of Mines with officers from the Medical Corps, War College, General Staff, Navy and civilian chemists, the Chemical Service Section was established as a unit of the National Army, with Lieutenant Colonel Wm. H. Walker, formerly of Massachusetts Institute of Technology, as chief of the American branch reporting to Colonel Potter of the Gas Warfare Division, and Lieutenant Colonel R. F. Bacon as chief of the Chemical Service Section in France reporting to Colonel A. A. Fries, head of the Gas Warfare Division overseas.

This was the first recognition of chemistry as a separate branch of the military service in any country or any war.

Later, Colonel Walker, as before stated, was transferred to the Ordnance Department, and was replaced by Lieutenant Colonel M. T. Bogert. The latter was in charge of the American branch of the Chemical Service Section at the time this section, together with all of the gas research laboratories and personnel of the Bureau of Mines, and the plant and field operations of the Ordnance and Medical Department pertaining to gas warfare, were united under Major General William Sibert, under the new title of Chemical Warfare Service.

It can not be brought out too strongly that the Chemical Service Section of the National Army was the first organized military body established for the sole purpose of relating chemistry to warfare. It took as an insignia

the old alembic of alchemy joined with the theoretical benzene ring which has so greatly accelerated the development of modern chemistry. It further adopted for its colors those of the American Chemical Society—cobalt-blue and gold.

The Chemical Service Section was of very great service, especially in systematizing the regulations of the War Department in regard to chemical personnel, and the status of chemists was ably defined through its influence, in the order of May 28, 1918. On account of its historical importance this order is quoted here.

1. Owing to the needs of the military service for a great many men trained in chemistry, it is considered most important that all enlisted men who are graduate chemists should be assigned to duty where their special knowledge and training can be fully utilized.

2. Enlisted chemists now in divisions serving in this country have been ordered transferred to the nearest depot brigade.

3. You will make careful inquiry into the number of graduate chemists now on duty in your command and report their names to this office. The report will include a statement as to their special qualifications for a particular class of chemical work, and whether they are now employed on chemical duties.

4. Enlisted graduate chemists now in depot brigades, or hereafter received by them, will be assigned to organizations or services by instructions issued from this office. The report called for in paragraph 3 herein will be submitted whenever men having qualifications for chemical duties are received by depot brigades, or replacement training camps, or by the training camps organized by the various staff corps.

5. Enlisted men who are graduate chemists will not be sent overseas, unless they are to be employed on chemical duties. Prior to the departure of their organization for overseas duties, they will be transferred to the nearest detachment or organization of their particular corps.

6. The chief of the Chemical Service Section will be charged with the duty of listing all American graduate chemists, including those in the Army and those in civil life.

7. Whenever chemists are needed by one of the bureaus or staff corps, request will be made on the chief of the Chemical Service Section for recommendations of a man having the qualifications necessary for the particular class of work for which he is desired. If men having chemical qualifications are wanted for only a short period of duty, they will be temporarily attached to the bureau or staff corps; where the duty is of a permanent nature, instructions covering their transfer will be issued. Whenever the chemists, thus attached or transferred, are no longer needed for purely chemical duties, a report will be made to the chief of the Chemical Service Section in order that they may be assigned to chemical duties at other places.

By order of the Secretary of War,

ROY A. HILL,
Adjutant General

These regulations have since been enlarged so that at present chemists may be furloughed back from the Army to colleges for instruction purposes or to industrial works for essential chemical production. Students may be continued in chemical courses to meet the future need for chemists, and any chemists in the Army may be assigned to war work wherever needed. All this has been done not for the sake of the chemists, but on account of the scarcity of trained chemists and the great need of the country for their services as chemists to help win the war. Without chemistry to-day the continuation of the war would be impossible.

A summary, necessarily brief, of the departments and bureaus utilizing chemists may be taken up in the following order:

I. ARMY

A. General Staff

Executive Division, Chemical Warfare Service.—This branch of the service established by General Order No. 62, already published in the chemical journals, is in command of Major General William Sibert, of the engineers. It has, according to the order above referred to, full charge of all phases of gas warfare, including research, manufacture, shell filling plants and proving grounds. It also continued the functions of the Chemical Service Section with increased authority.

All newly drafted chemists are assigned to the Chemical Warfare Service to be detailed or transferred or furloughed where needed. It is charged with the "responsibility

of providing chemists for all branches of the government and assisting in the procuring of chemists for industries essential to the success of the war and government."

It has an authorized personnel of 45,000, of which any portion may be chemists if needed. At present there are approximately 1,400 graduate chemists in the Chemical Warfare Service.

B. Ordnance Department

(*a*) *Engineering Division, Explosive Section.*—Under the direction of Colonel J. P. Harris, this division has ten commissioned and six civilian chemists. This section concerns itself with the solution of all engineering problems connected with propellants, the loading of high explosives into shells, trench warfare containers, primers, the research in high explosives, the investigation of explosives submitted for testing, efficiency of methods of manufacture and the carrying out of tests for developing substitutes.

(*b*) *Procurement Division, Raw Materials Section.*—The Chemical Branch of this division under the direction of Major W. H. Gelshenen utilizes the services of five officers whose experience has been chiefly on the commercial side of chemical industry.

(*c*) *Inspection Division, Explosive Section.*—The chemical work of this division is under the direction of Major Geo. B. Frankforter, who has a personnel of somewhat more than 1,000 chemists under his direction. Major Moses Gomberg is supervisor of special process work. The chemists are divided into three grades—"inspectors" who are responsible for all powders meeting specifications; "analytical chemists" who analyze and test all powders and report results to inspectors; "linemen" who are control chemists having charge of certain steps in the process of manufacture.

These chemists are employed throughout the United States at explosive plants, chiefly inspecting processes of manufacture and the finished product. The section maintains an officers' training school at Carney's Point for training for inspection, testing and process control of explosives. Graduates of the school are, in a few instances, commissioned; otherwise they are retained in a civilian capacity. There is a tendency to place all men in uniform as rapidly as possible. There has been such a demand for chemists that most of them have not finished the training before being given experience in the plants, so that they are obtaining their training and experience at the same time, with the expectation of returning to the school for more theoretical work before graduation.

The school at present has 150 chemists taking training with from six to ten instructors. The training consists of an extensive review of organic and inorganic chemistry, chemical engineering, including mechanics and plant operations; also a review of physics and a special study of the chemistry of explosives both in the laboratory and in the plant. The school has good laboratory facilities and a school day of ten hours. Civilians who are taken into the school are paid at the rate of $1,500 to $2,000 from the time they enter.

Recently a supervisory and control laboratory with 20 chemists has been established in Philadelphia for the purpose of making control analyses and investigating certain problems having to do with the inspection of explosives.

(*d*) *Inspection Division, Metallurgical Section.*—This division employs 79 chemists, 23 being in uniform. The work is in charge of Major A. E. White, and laboratories are maintained at 25 of the leading steel plants of the country, with the central control laboratories in the buildings of the Bureau of Mines at Pittsburgh. Also, two chemists are working in the laboratories of the Bureau of Standards for this branch of the service. With the exception of the central control laboratory and the work at standards, the work of this section consists chiefly of the analyses and control of ferrous products.

(*e*) *Production Division: (1) Explosive Section; (2) Raw Materials Section.*—This work is under the direction of Major E. Moxham, with Major C. F. Backus in charge of the Explosives Section and Major M. S. Falk in charge of the Raw Materials Section. The section numbers among its personnel 18 chem-

ists or chemical engineers engaged in executive and administrative work on the production of smokeless powder and high explosives. The section has no laboratory facilities, the work accomplished being chiefly in facilitating increased production through specializing in the various works on manufacturing problems.

The division has been concerned with the investigation of new processes for the production of raw materials, some of which have been put into operation, especially the production of toluene by the cracking of petroleum. The Raw Materials Section arranges for the production and distribution of raw materials, such as nitric acid, sulfuric acid, benzene, phenol, ammonia and sodium nitrate. Besides investigating new processes, the section studies increased production and distribution of supplies. For the main part the chemical personnel is on duty at various plants investigating production and processes.

(*f*) *Nitrate Division.*—Colonel J. W. Joyes is in charge of this Division, with Lieutenant Colonel A. H. White in charge of the Research Technical Section. The Nitrate Division was organized shortly after war began with the special duty of installing plants for the fixation of air nitrogen. It now has a personnel of 130 chemists and chemical engineers, enlisted and commissioned. It has only a few civilian chemists in its employ. It has cooperated with and received help from the laboratories of the Massachusetts Institute of Technology, the Geophysical Laboratory, the University of Michigan, the Bureau of Soils (Arlington), the Bureau of Standards and the Bureau of Mines. It has built extensive works at Sheffield, Ala. It has a small experimental plant at the Georgetown Gas Works, and another at Greene, R. I. In cooperation with the Bureau of Mines, it carried on experiments on ammonia oxidation at Syracuse, N. Y., and at Warner's, N. J. The division is one of the most important from the chemical development standpoint that has been established for war purposes. It has very large appropriations at its disposal and it has two nitrate plants in Ohio in preliminary stages of erection. It contemplates other activities in nitrogen fixation.

The Ordnance Department also runs four arsenals—Picatinny, Watertown, Frankford and Rock Island—in all of which chemists are regularly employed. The number of chemists in the arsenals has been largely increased since the war began. No figures are at the moment available.

C. Quartermaster's Corps

The chemical work of the Quartermaster's Corps involves the testing and analyses of materials, foods, leather, paper, etc., the making of specifications, and the control of materials to find if the specifications are complied with. The corps has few chemists in uniform, as the work has been done chiefly in the laboratories of the Bureau of Chemistry.

The filtration plants at the various government camps and cantonments are also under the control and direction of the Quartermaster General.

D. Surgeon General's Office

Food and Nutrition Division, Medical Department, Sanitary Corps.—This division has 91 food and biological chemists who are in uniform. In each camp there is stationed one nutrition officer who is preferably a food expert with as much physiological, biological and sanitary training as possible. His duty is to inspect all food, mess halls, refrigerators, etc., with the object of maintaing a high degree of sanitation. He has full authority to see to it that meat, for example, is destroyed if dropped upon the ground in hook worm territory; also any other food that could in any way injure the health of the men. There are three survey parties in the Sanitary Corps whose duties consist in going from camp to camp, getting information regarding garbage and collecting data on nutrition problems. This is put in the form of curves in the Washington office. The work is part of an extensive nutritional study and is expected to give important results for future use as well as for present Army needs.

Research, with reference to the physical

properties of various proteins, creatin, etc., is being carried on for the corps in the laboratory at Cambridge under Dr. Henderson. Research relative to rope disease in bread, catalytic action in relation to yeast activity, etc., is progressing, from which valuable results are already in sight. At the Harriman Research Laboratory the special problem is meat spoilage. It is hoped it will be possible to detect incipient spoilage by chemical means. At the Bureau of Chemistry, Department of Agriculture, members of the Sanitary Corps are working on garbage research and making a survey of all food furnished to the various camps. An examination is made of all garbage cans in order to determine how much of the food finds its way into the stomachs of the men. This has resulted in a great saving of food material.

At the University of Rochester investigations have been made as to the effect of temperature in desiccated vegetables, as it is thought high temperatures used in desiccation may tend to induce certain diseases, such as scurvy, pellagra, beri beri, etc. A safe temperature is being studied. Independent investigations bearing upon the work of the Sanitary Corps are being carried out in the Bureau of Chemistry.

The Sanitary Corps maintains a school for the training of nutrition officers at Fort Oglethorpe, in connection with the Medical Officers' Training School. Men sent to this school are selected from the standpoint of training and experience in food and nutrition work, together with biological training. Frequently the men are commissioned before entering the school, if they have had sufficient training, although in certain instances privates have entered the school and ben granted commissions later.

E. Aircraft Production

This Bureau now requires the services of 51 chemists in two sections. There is the Section of Chemical Research under Dr. H. D. Gibbs, who has 18 chemists (13 in uniform) engaged specifically in research problems, plant operations, study of new materials, chemical processes, methods of making new chemicals required in airplane construction, etc. Interesting studies are also being conducted on certain photographic sensitizing dyes to be used in airplane photography. This Bureau also maintains in Pittsburgh an inspection and control laboratory employing 33 chemists, 5 in uniform and 28 civilians. This laboratory has 60 technical men, of whom 30 are chemists. These chemists were afforded space in the Bureau of Standards until April 1, when they were removed to the home of the Pittsburgh Testing Laboratories, Pittsburgh, Pa. The work is in charge of Dr. H. T. Beans. The laboratory has general control of all products purchased by the Aircraft Production Board; it develops specifications for new materials and sends chemists into the plants to get the grades of materials wanted.

II. NAVY

The Navy also requires chemical aid in warfare, and at the present time has approximately 200 chemists engaged chiefly in control work and plant operation. Each of the navy yards has a control laboratory and the Ordnance Bureau has about 100 chemists, of whom approximately 20 are commissioned, 35 enlisted and 50 civilian. These are utilized in much the same capacity as in the Army Ordnance.

From the first the Navy has immediately transferred to Chemical Service the names of all chemists enlisted in the Navy, where the names and qualifications have been made known to them. While of course the total number is small, the proportionate need has apparently been greater, for there are still several hundred graduate and experienced chemists and chemical engineers, both officers and men, in the Navy, a large proportion of whom have expressed their willingness to serve as chemists if needed, but who are still in the fighting branch or whose duties have no relation to chemical service.

III. CIVILIAN BUREAUS

The Bureau of Chemistry, the Forest Products Laboratory and other bureaus of the Department of Agriculture, the chemical labora-

tories of the Bureau of Mines, Bureau of Standards, and the Treasury Department have all cooperated with their full force in any war problems presented to them. Many of these problems have originated and been carried to a successful conclusion within the bureaus themselves. The civilian personnel of the bureaus has been depleted in almost every instance by the war, but men have been assigned by the War Department to assist in war problems. For example, the Bureau of Standards at present has 70 men in uniform assigned to it from various branches of the government. These are for the main part engaged on studies of new methods of analysis, research on analysis of special materials, analysis of government supplies, and development of airplane dopes, and study of new and improved specifications on government supplies. The studies of electroplating with reference to government needs and the study of the physical characters of alloys have been taken up.

The truly extensive chemical work of the civilian bureaus and their relation to war work will be published in detail at some future time.

IV. COMMITTEE ON CHEMICALS. CHEMICAL ALLIANCE WAR INDUSTRIES BOARD

In the very early days of the war, the Committee on Chemicals, headed by Dr. Wm. H. Nichols, president of our society, and consisting of the leaders of our chemical industries, gave unstinted and invaluable service to the government in coordinating the country's chemical manufacturing resources, in increasing the output of our chemical plants, and in allocating and fixing prices to the government of the finished product.

The value of these services can not be overstated, although comparatively little has been written about them.

When the various war committees of the Council of National Defense were discontinued and their functions absorbed by the War Industries Board, the Chemical Alliance was formed to serve as a clearing house of the chemical manufacturers in their dealings with the government through the War Industries Board. It was organized primarily at the request of the Department of Commerce to assist in clearing up business questions in connection with the importation of pyrite, but later it became a regularly organized trade association, without any official government connection, to which the War Industries Board can turn for expert advice.

Some of the directors at first were original members of the Committee on Chemicals, with Dr. Nichols as president. Later Dr. Nichols retired and Mr. Horace Bowker, vice-president, was made president of the Alliance.

The War Industries Board has been active in the chemical field since its inception. It has well-organized committees to deal with chemical trade matters, especially with the allocating of material, fixing of prices, study of contracts, and a clearing of orders for both the Army and Navy.

V. NATIONAL RESEARCH COUNCIL

The National Research Council early organized a chemistry committee, of which Professor M. T. Bogert was made chairman. When later Professor Bogert was appointed lieutenant colonel in the Chemical Service Section, Dr. John Johnston was put in charge of this work for the National Research Council, and continues in that capacity.

A meeting of prominent chemists takes place in Washington in the rooms of the National Research Council twice weekly, and the conferences serve as a clearing house of research work going on in Washington and in the country. The National Research Council has from the first served as a valuable feeder and intermediary on research between the universities and the government. The council has suggested and cleared many research problems both in this country and abroad.

VI. GEOPHYSICAL LABORATORY

The Geophysical Laboratory, under the direction of Dr. Arthur L. Day, has engaged in important work since the beginning of the war. The developments which this laboratory have made in optical glass are well known and have had an important bearing on the war's progress. The laboratory has been assisting

on the nitrate investigations and other problems. The high standing of its corps of chemists is well known to all members of our society.

VII. THE WAR TRADE BOARD, SHIPPING BOARD, FOOD ADMINISTRATION, TARIFF COMMISSION

These important government departments all require chemists and utilize chemists in a consulting and directing capacity.

The War Trade Board has a member, Dr. Alonzo E. Taylor, who is assisted in passing upon chemical matters by Dr. A. S. Mitchell, Mr. B. M. Hendrix and Dr. R. P. Noble.

The chemical work of the Shipping Board has been under the direction of Dr. W. B. D. Penniman, who, while shutting off the importation of certain products, has helped produce excellent substitutes therefor.

The Food Administration has been guided in chemical matters chiefly by Dr. Alonzo E. Taylor and Mr. Charles W. Merrill.

The chemical work of the Tariff Commission is under the direction of Dr. Grinnell Jones, who this morning gives you a full description of the information being gathered by the Tariff Commission on chemical matters to guide it in its recommendations to Congress, both during and after the war.

Many departments of the government have been in constant communication with our allies on research and industrial chemical matters. Chemical liaison officers have been sent from the Army and Navy and some of the civilian bureaus to keep in touch with foreign development and practise, and their services have been invaluable. In this connection it should be particularly pointed out that not all of the development of chemistry in this country is our own accomplishment, for we have obtained information of the highest importance through the efforts of these liaison officers. On the other hand, chemical information of the highest importance has been sent from America to Europe.

War, the destroyer, has been on the other hand the incentive to marvelous chemical development with a speed of accomplishment incomprehensible in normal times. Discoveries made in the search for instruments of destruction are already in use for the development of chemical industry. Many others, unpublished as yet, and to remain unpublished until the war is over, will prove of the utmost benefit to mankind. The same agencies that add to the horror of war to-day, the same reactions which are used in the development of explosives and poisonous gases, on the one hand, and in counteracting their effect, on the other, will find immediate and useful application in the years to come.

The war has been prolonged by chemistry. The German chemist apparently working for years with war in view has supplied the German armies with the means for their ruthless warfare, but the chemists of America and our Allies have met them fully in chemical development, and when the chemical story of the war is written where all can read, it will be the verdict of history that the chemists of America were not found wanting.

The chemical program of the United States Army and Navy has been at all times ahead of our trained man power and the mechanical devices necessary to apply what the chemists of America have produced.

Charles L. Parsons,
Chairman of the Committee on War Service for Chemists

SCIENTIFIC EVENTS

THE CAWTHRON INSTITUTE OF SCIENTIFIC RESEARCH

We learn from the *New Zealand Journal of Science and Technology* that at a meeting of the Cawthron trustees held on May 30, 1918, the appointment of the advisory board was confirmed for six years from the date of their appointment on September 25, 1916. The advisory board consists of Sir James G. Wilson (chairman), Professor W. B. Benham, Dr. L. Cockayne, Professor T. H. Easterfield, Dr. P. Marshall and Professor R. P. Worley.

The advisory board, in conjunction with the chairman of the trustees, is to make inquiries in regard to the appointment of a director, such director to be a chemist with biological